

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Improvements in or relating to an Apparatus for Classifying or Separating Material into Sizes or Grades

We, MASCHINENFABRIK HARTMANN AKTIEN-GESELLSCHAFT, a German Company, of Waldstrasse 220, Offenbach on Main Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an apparatus to which granular and/or powdery materials are fed in a main air stream for separation and grading by centrifugal action and are subjected to the action of a secondary air stream for obtaining a finer grading of the materials as to size.

The main object of this invention is to improve the construction of the separating and grading apparatus in order to obtain a more efficacious action of the secondary air and, therefore, improved grading of the materials.

According to this invention apparatus for separating and grading materials comprises an upper chamber having a tangential inlet for air-borne materials and a central outlet for the carrier air and fine particles, and a lower chamber having therein an inverted, truncated cone which substantially confines centrifugal separation of the materials to the upper chamber, and means for directing secondary air through the centrifugally separated materials when descending through or entering a space defined by the truncated cone and the peripheral wall of said lower chamber and leading to an outlet.

Reference will now be made to the accompanying diagrammatic drawings which illustrate, by way of example, three different embodiments of the invention.

Figs. 1—3 are vertical sections, each illustrating a different embodiment of this invention.

Fig. 4 is a sectional plan view taken on the line IV—IV, Fig. 3.

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Fig. 5 is a view similar to Fig. 4 but shows a slight modification.

The embodiments according to Figs. 1 to 3 each comprise an upper chamber 1 having a tangential inlet 7 for the materials which are fed in a main air stream through the inlet 7 to chamber 1 which has a central outlet 8 for the fine particles and carrier air. The chamber 1 communicates with a lower, funnel-like chamber 4 containing an inverted truncated cone 9 having a top wall 5. According to Figs. 1 and 2, a central pipe 10 for secondary air passes through the truncated cone 9, the peripheral wall of which forms a space S with the peripheral wall of the lower chamber 4 which has an outlet 11. The material supplied through inlet 7 undergoes centrifugal separation in the upper chamber 1, the finer particles being carried out through outlet 8 and coarser particles descending to outlet 11 through the space S. The flow of the secondary air is indicated by the arrows in Figs. 1 and 2.

Referring now to Fig. 1, an annular inwardly directed passage 12 is formed between the upper periphery of the truncated cone 9 and the bottom of the upper chamber 1 which is inwardly diverted as indicated at 3. The passage 12 leads to the upper chamber 1 and also to space S. The coarser, centrifugally separated material in zone 2 of the upper chamber 1 passes into space S through passage 12 through which counterflow of the secondary air takes place. This air acts on the descending material over an extended path in space S and fully penetrates the material as it passes through passage 12 from the lower zone 2 of the upper chamber 1. As a result, finer particles entrained with the coarser, centrifugally separated material are carried towards the axis of chamber 1 for discharge through outlet 8.

In the embodiment according to Fig. 2, the

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space S is constricted at its upper end by inwardly diverting the adjacent portion 13 of the lower chamber 4. The secondary air thoroughly penetrates the material passing through space S. In the embodiments according to Figs. 1 and 2, the secondary air diverted by parts 3, 13 tends to blow the particles away from the adjacent chamber wall and penetrates transversely through the materials, thereby effecting a finer grading as to size.

The position of the truncated cone 9 may be adjusted vertically in order to vary the cross-sectional area of the passage 12 and thereby to regulate the speed of the secondary air. In this way, the grading and quantity of the material passing through the apparatus to the outlet 11 may be varied.

In the embodiment according to Figs 3 and 4, the central pipe 10 for the secondary air is omitted. Instead, the secondary air is admitted through conduits 104 to a circular chamber 103 from which it passes into the lower end of upper chamber 1 through a porous ring 102. The centrifugally separated material descending spirally down the wall of chamber 1 is penetrated when entering space S, in substantially radial directions by the secondary air admitted through the porous ring 102. The porosity of the ring 102 is chosen to suit the desired grading and specific weight of the material to be treated. In the case of a fine light material which offers small resistance to the passage of the secondary air, the porosity of the ring 102 may be comparatively coarse. If desired, the pores may be tangentially directed to admit the secondary air in substantially the same direction as that of the main air admitted through the inlet 7. This has the advantage of preventing congestion of the pores by the fine material. When the material to be separated and graded is coarse and heavy, a porous ring 102 having smaller pores and consequently higher resistance to flow of the secondary air may be employed. If desired, the secondary air chamber 103 may be sub-divided into sections 113 as indicated in Fig. 5. This sub-division is of advantage as it enables the secondary air to be supplied at different pressures or at different angles into the chamber 1.

Fig. 3 shows an alternative position for admission of the secondary air, i.e. near the bottom of the lower chamber 4 as may be more convenient in some cases. Secondary air is admitted through conduits 141 into an annular chamber 131 from which it passes into chamber 4 through a porous ring 121.

If desired, the porous ring 102 or 121 may be made of resilient material, thus enabling the porosity to change in accordance with variation of pressure. Pneumatic or mechanical means may be provided to maintain the pores in a clean, permeable condition.

It will be appreciated from the foregoing description that the inverted truncated cone substantially confines the centrifugal action to the upper chamber and that the secondary air, which enables a finer grading of the material to be obtained, penetrates completely through the material, mainly in a radial direction away from the peripheral wall of the upper or lower chamber, and thus acts on the finer material that tends to cling to the wall.

#### WHAT WE CLAIM IS:—

1. An apparatus for separating and grading granular and/or powdery materials, comprising an upper chamber having a tangential inlet for air-borne materials and a central outlet for the carrier air and fine particles, and a lower chamber having therein an inverted, truncated cone which substantially confines centrifugal separation of the materials to the upper chamber, and means for directing secondary air through the centrifugally separated material when descending through or entering a space defined by the truncated cone and the peripheral wall of said lower chamber and leading to an outlet.
2. Apparatus according to Claim 1, wherein at the bottom of the upper chamber there is an annular, inwardly directed passage leading to the chamber and to said space through which the secondary air is supplied for penetration through the material entering said annular passage.
3. Apparatus according to Claim 2, wherein the annular passage is partly defined by the upper peripheral portion of the truncated cone.
4. Apparatus according to Claim 1, wherein the said space is constricted at its upper end, whereby the secondary air, which is supplied upwardly through said space, thoroughly penetrates the material descending into and through the space to said outlet.
5. Apparatus according to Claim 2 or 3, wherein a central pipe extending vertically through the apparatus passes through the truncated cone and serves for the supply of the secondary air to said space through which it passes upwardly into said upper chamber.
6. Apparatus according to Claim 1, in which a peripheral part of the upper chamber is air-permeable to allow of admission of the secondary air.
7. Apparatus according to Claim 1, in which a peripheral part of the lower chamber is air-permeable to allow admission of the secondary air.
8. Apparatus according to Claim 6 or 7, wherein the porosity of the air-permeable portion of the chamber wall is controllable.
9. Apparatus according to Claim 8, wherein the air-permeable portion of the chamber wall consists of resilient material.
10. Apparatus according to Claim 6 or 7, wherein the air-permeable portion of the

chamber wall is composed of sections of different porosity.

11. Apparatus according to Claim 6 or 7, in which the air-permeable portion of the chamber wall is designed to admit the secondary air tangentially into the chamber so as to flow in substantially the same direction as that of the main air.
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12. Apparatus according to Claim 6 or 7, wherein mechanical or pneumatic means are provided for maintaining the pores of the
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air-permeable portion of the chamber in a clean, air-permeable condition.

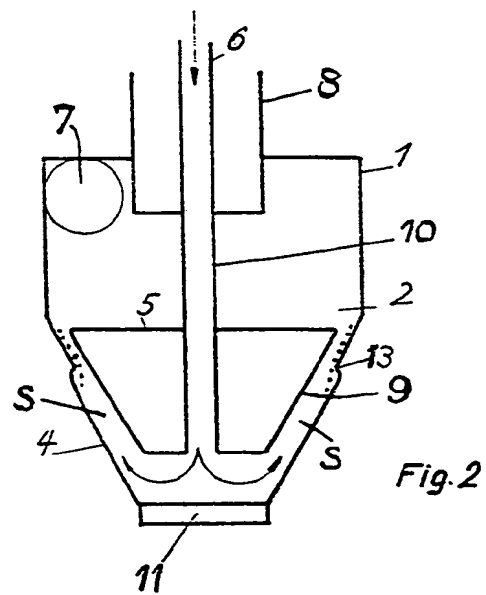
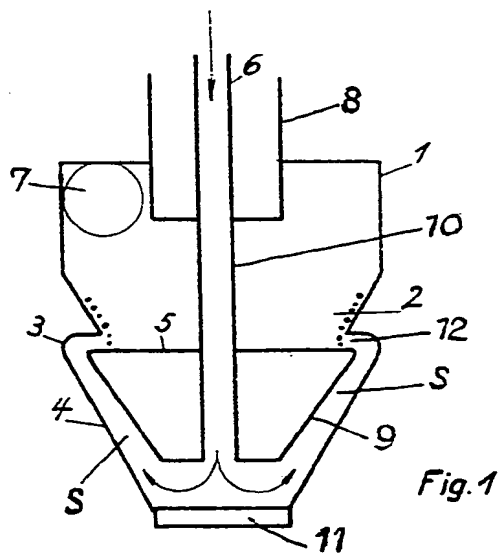
13. An apparatus for separating and grading materials constructed substantially as hereinbefore described with reference to Fig. 1, 2 or 3 of the accompanying drawings.
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2 SHEETS

## COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.

SHEETS 1 & 2

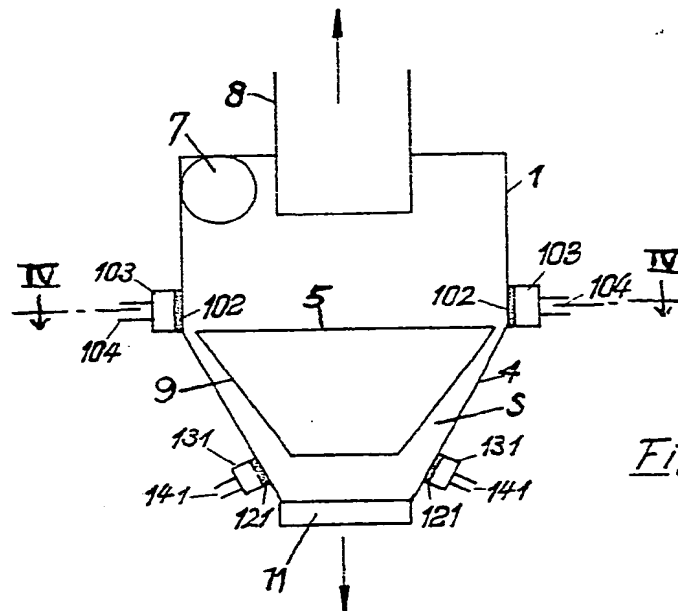


Fig. 3

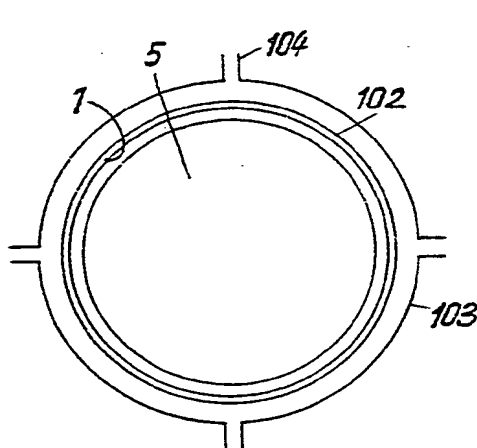


Fig. 4

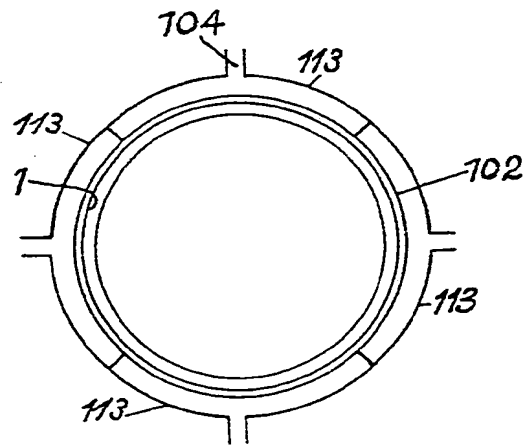


Fig. 5

